



U.S. AIR FORCE

Air Force Materiel Command



Dominant Air Power: Design For Tomorrow...Deliver Today

Developing, Fielding, and Sustaining America's Aerospace Force



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The Predator Unmanned System

From Advanced Concept
Demonstrator to Transformational
Weapon System

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Integrity - Service - Excellence

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Why UAS? Operator Pull



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- **Advances in Sensor Technology**
 - Reduced Size & Weight
 - High Resolution
 - Permit Detection of Fixed and Moving Targets
- **Pressure to Minimize Casualties both Civilian and Military**
- **Requirement for Persistent Surveillance of the Battle space**
 - Taxes or Exceeds the Limits of Human Endurance
- **High Marks from Combatant Commanders in Serbia, Afghanistan and Iraq**



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Technology Transition Resistance



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- 1. Culture And Policy**
 - **Long Standing, Large Organizational Bias Against New, Unproven Technology Or Concepts**
- 2. Competition With Legacy And Other Programs For Funds**
- 3. Program Start Stop Syndrome –**
 - **Uncertain Requirements**
 - **Stop Production In Favor Of Next Best UAS**
- 4. Greater Than Expected Costs, Mishap Rates, Survivability Concerns**
- 5. Radio Frequency Bandwidth Concerns And Interoperability**

Ref: *OSD UAS Roadmap*

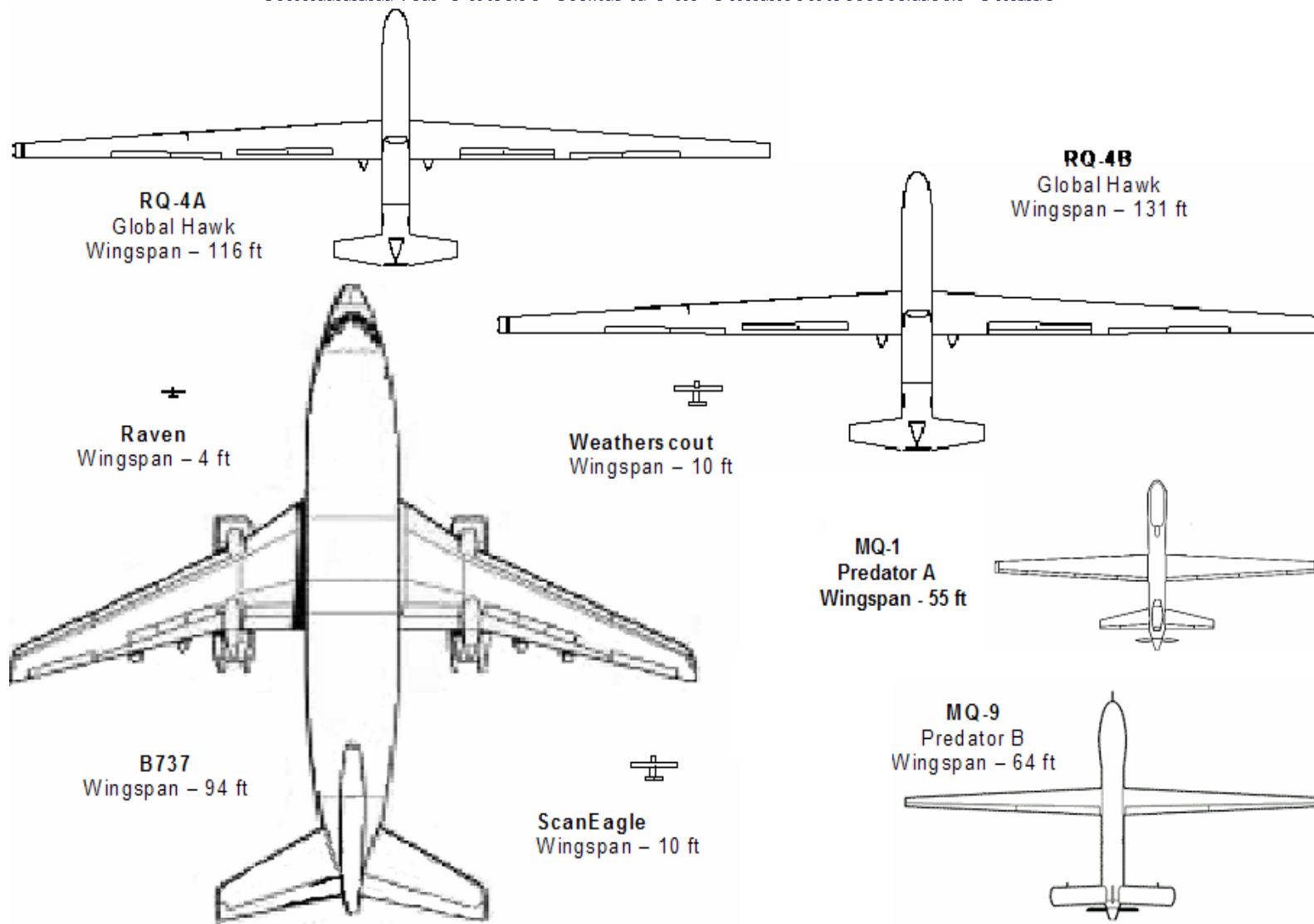


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RSW UAS Size Comparison



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MQ-9A Program Description



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•Hunter-killer (*Reaper*)

- Find, Fix, Track, Target, Engage And Assess
- Prosecute Critical Emerging Time Sensitive Targets
- Radar-based Targeting With Organic Hard-kill Capability
- Secondary Role Of Intelligence, Surveillance, Reconnaissance

Wingspan:	66 FT
Length:	36 FT
Max Speed:	240 KTAS
Max Endurance:	24 hr
Max Fuel:	4,000 lb
Max Altitude:	50,000 ft
GTOW:	10,500 lbs
External Payload:	3000 lbs (6 wing hard points)





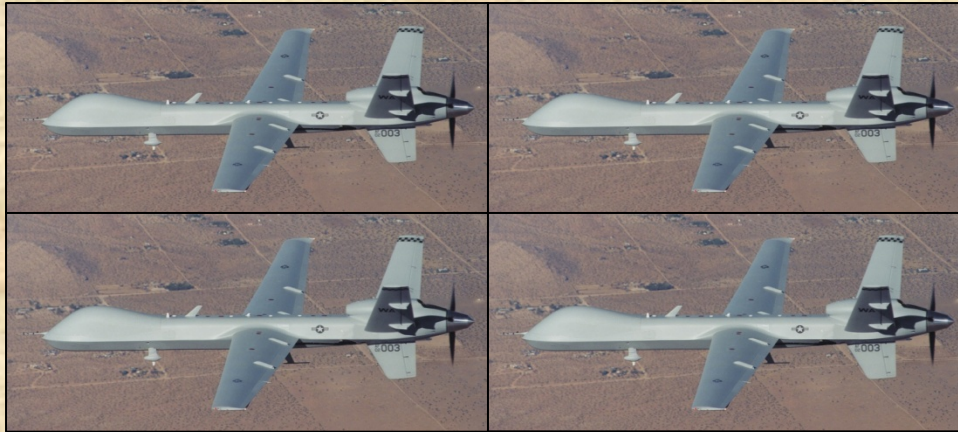
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MQ-9A System Description



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Forward Operating Base



MQ-9A Air Vehicles



Launch & Recovery
Ground Control
Station



Ground Data Terminal
(Line of Sight Link)



Support Equipment
& Ready Spare Parts

Intermediate OL



Primary Predator Satellite Link
(SATCOM / Beyond Line of Sight)

Main Operating Base



Fixed Ground Control Station

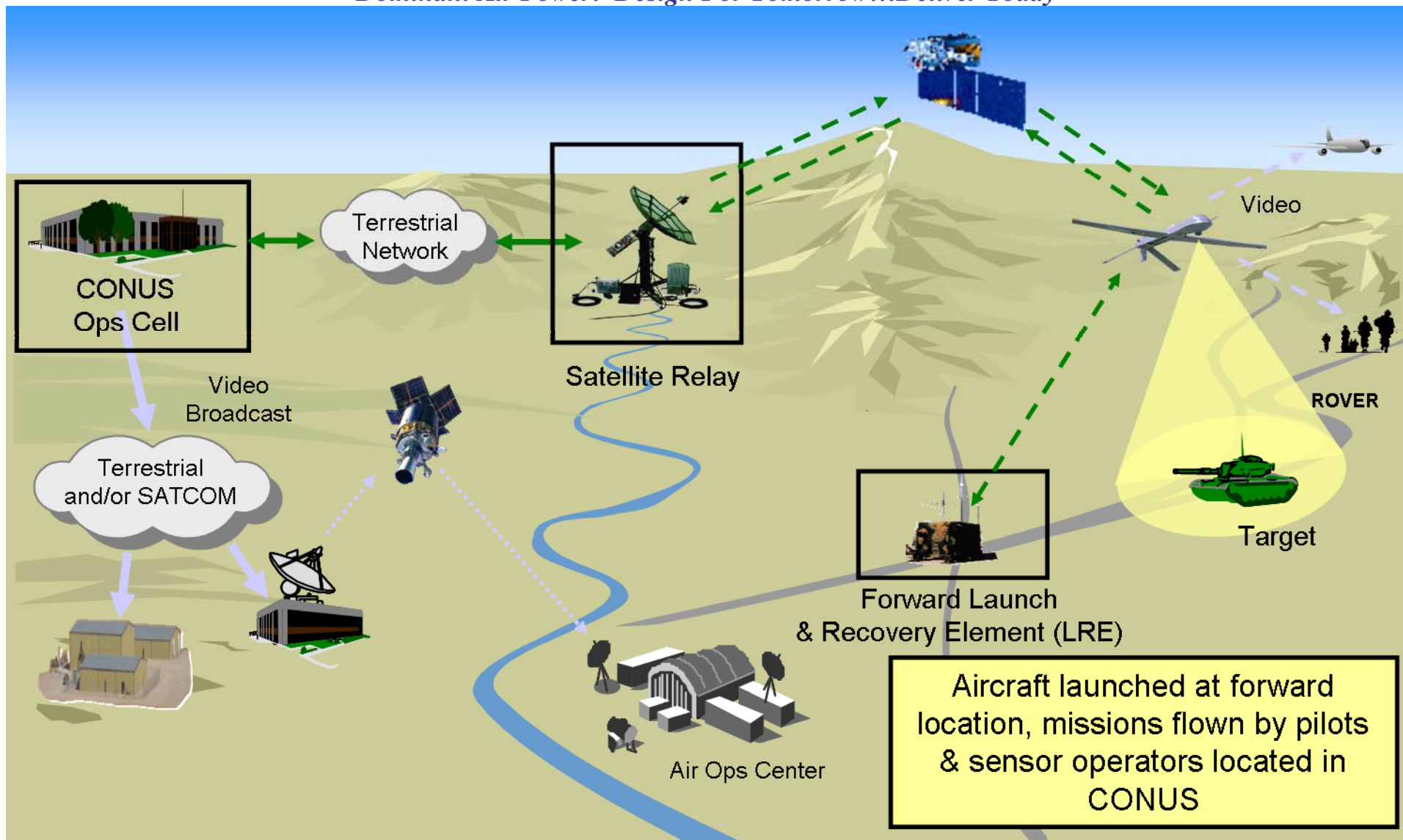


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Remote Split Operations (RSO)



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Critical Enablers



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- **MQ-1 Predator With Hellfire (FY2001)**

- Required CSAF Gen Jumper Top Down Leadership

- Familiar With System Since Bosnia
 - Drove The Weaponization Effort



- **Rover (FY 2001)**

- Developed As An Urgent Warfighter Need For AC-130 Gunship (FY 2001)
 - Transitioned To Ground Forces (FY2002)

- **These Two Technologies Combined To Create The Perfect Tool For Iraq And Afghanistan**

- Broke Down A Large Number Of Stovepipes



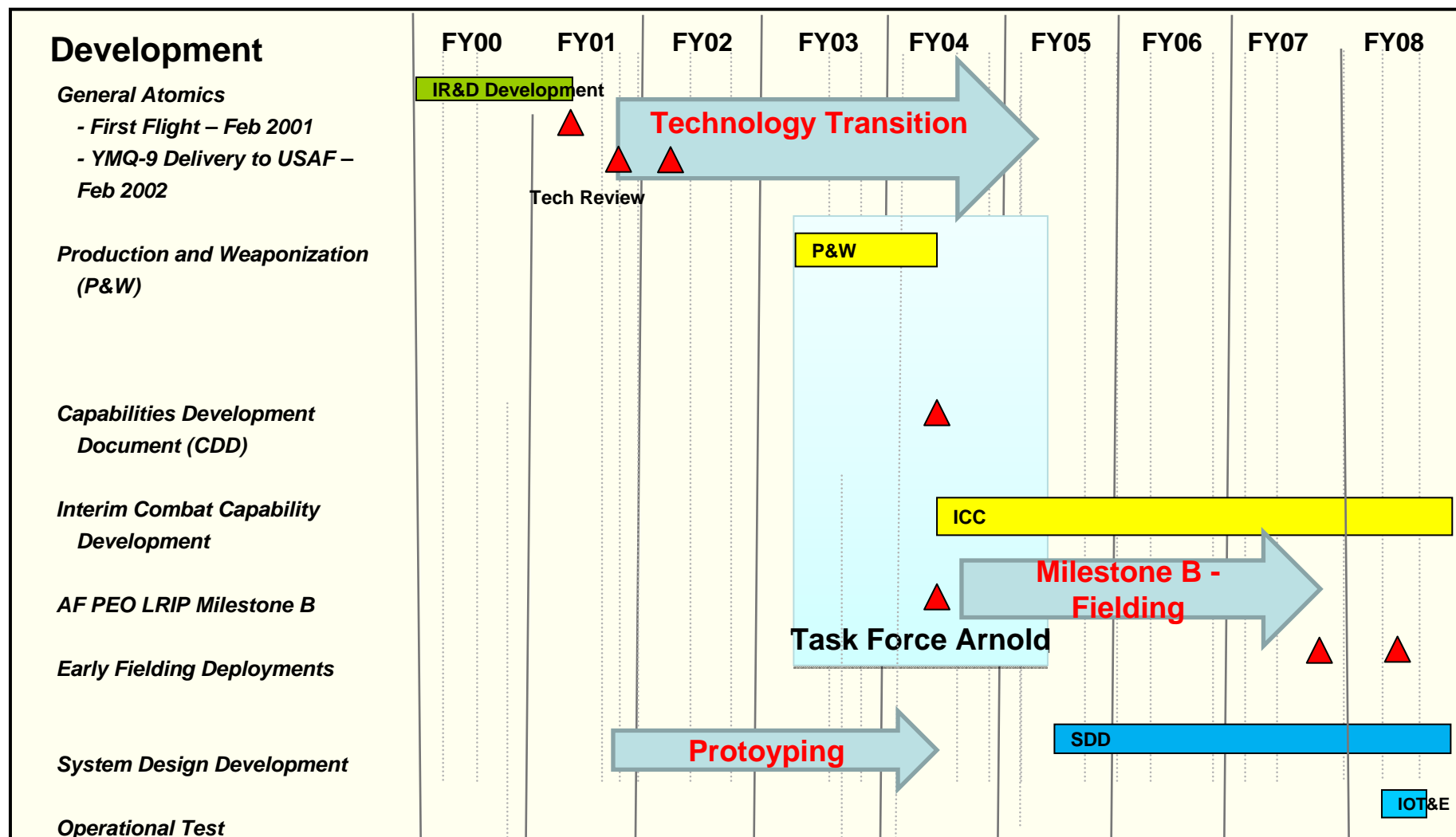


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Schedule



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Technical Transition Phase Prototyping



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- **Originated As Industrial Research And Development (IRAD) Program By GA-ASI In 2000**
 - First Flight in Feb 2001



- **Post 9-11-01 Accelerated Purchase Of First Two YMQ-9 “Predator B” – Support War On Terror**
 - Delivered First “As Is” Configuration To USAF In Feb 02
 - Used DERF (Defense Emergency Response Funding)
 - Expanded Envelope And Payload Capacity (Beyond MQ-1)
 - Early Focus On Agile, Quick Reaction Development/Test



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Technical Transition Phase Prototyping



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- **Predator B Tech Review (Dec 2001) Held Prior To Purchasing Two Prototypes**
- **Findings**
 - **A/C #1 And #2 - “Development” Aircraft - Not FAR 23 Compliant**
 - **Limited Flight Testing To Date (Approx. 90 Flight Hrs)**
 - **Performance Estimates Available - GA Analytical Numbers**
 - **High Altitude Endurance Flight Test In Progress (Up To 50 K-ft)**
 - **A/C Capability -- “Fall-out” Of Current Configuration**
 - **Structural Limitations - Landing Gear & Wing Structure (A/C#1)**
 - **Both Less Than 10,000 lbs GTOW**
 - **Similar Electronic System Reliability To Predator A - Single Thread Flight Controls**



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Technical Transition Phase Task Force Arnold



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•Task Force Arnold (TFA) Created To Increase Oversight

- Senior USAF Leadership (Secretary Of The Air Force, Chief Of Staff Of The Air Force, Commander Of Air Combat Command)
- Conducted From Feb 03 Thru Jun 05
- Focused On Warfighter Capabilities And Priorities
- Provided Stable Vector, Direction And Objectives

•Oversaw Multi-phase Transitional Efforts

- Productionization And Weaponization (P&W) – Jul 03
 - Strengthened Structural Integrity (Expand Payload Capacity)
 - Improved Avionics And Flight Controls (Fully Redundant)
 - Improved Communication, Radar (Lynx SAR) And EO/IR Sensor
- Interim Combat Capability (ICC) – Apr 04 Basic Weapons Capability
 - GBU-12 / AGM-114 HELLFIRE / GBU-38 JDAM (FY08)
 - 45kVA High Capacity Starter-Generator System
 - FAA Certified 1-Box Digital Electronic Engine Control (DEEC)



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Technology Transition Phase Results



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- **Air Combat Command Program Direction Approved By JROC (Joint Requirements Oversight Council)**
 - Capability Development Document (Inc I) – Dec 04
- **Air Force Program Executive Officer Approved Milestone B (LRIP I) – Feb 04**
 - Approved 10 Pre-production Prototypes
 - Approved 4 A/C For First Low-rate Initial Production (LRIP I)
 - Continue R&D Efforts To Improve Capabilities
- **Congress Added 7 More A/C (FY04)**





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System Development And Demonstration (SDD) – Mar 05



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- **Improved Weapons Capability**
 - GBU-12 / AGM-114 HELLFIRE / GBU-38
 - Improved BRU-46(SL) Bomb Rack Development/Integration
 - Stores Management System (SMS) Improvements
- **Lynx SAR Improvements**
- **Blue Suit Technical Order Development**
- **Logistics Management Information (LMI)**
- **Electromagnetic Interference / Environmental Testing**
- **Airworthiness Certification**

“Normalize But Don’t Slow Down”



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Conclusions



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- **MQ-9 Was Able To Overcome Technology Transition Resistance**
 - ✓ **Culture And Policy - Long Standing, Large Organizational Bias Against New, Unproven Technology Or Concepts**
 - **Followed MQ-1/Rover Success**
 - ✓ **Competition With Legacy And Other Programs For Funds**
 - **Aircraft System Is Inexpensive Relative To Other Weapon Systems**
 - ✓ **Program Start Stop Syndrome –**
 - **Uncertain Requirements**
 - **Stop Production In Favor Of Next Best UAS**
 - **High Level Champion In Task Force Arnold**
 - **Consistent Funding, Requirements**
 - **Over 22,700 Flight Hours**



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Conclusions



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- ✓ **Greater Than Expected Costs, Mishap Rates, Survivability Concerns**
 - **MQ-1 Mishap Rates Have Improved Dramatically**
 - **MQ-9 Leverages MQ-1 Lessons Learned (Ex. Redundant Flight Systems, Planned A/W Certification)**
- ✓ **Radio Frequency Bandwidth Concerns And Interoperability**
 - **Interoperability With MQ-1 Ground Stations, Rover, Video Exploitation, Etc**



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Summary



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- **Successful Transitions Require:**

1. **High Level Champion**
2. **Needs To Integrate With Existing Operator Infrastructure**
3. **Early Successes**
4. **Operator Needs To Be Involved Early**
 - **Willingness To Experiment**
 - **Requirements**